ROYAL ASTRONOMICAL SOCIETY.

VOL. II. *February* 8, 1833. No. 18.

Report of the Council of the Society to the Thirteenth Annual General Meeting, held this day.

IN addressing the Fellows of the Society at this their thirteenth Anniversary, the Council cannot but congratulate them on the increased prosperity of their affairs, and on the more extended influence of their Institution. New observatories have been built, and are still building, not only in this country, but in other parts of the world; with all of which this Society has placed itself in active correspondence; — and from these co-operations the most beneficial results may be expected.

Whilst adverting to communications of the kind just alluded to, and at the same time regarding the usual routine of the business of the Society, the Council cannot refrain from expressing their regret (and it has, indeed, for a long time been an annual source of complaint) that great inconvenience is constantly felt from the want of suitable apartments, wherein the business of the Society might be regularly conducted, and their Library and Museum (now not inconsiderable) properly arranged and conveniently consulted. It was hoped, and indeed expected, that before this time the Council would have been able to report some definite result to the applications which have so long been made for apartments in Somerset House; but, up to the present hour, the Council are still in the same state of uncertainty, and regret that they are unable to report more favourably than last year.

In the last Report of the Council, it was mentioned that a Committee had been appointed to consider, arrange, and propose, a set of *Requisite Tables* to be used with the *New* Nautical Almanac. That Committee has since made its Report, which has been communicated to the Lords Commissioners of the Admiralty, who have, with that attention to the interests of navigation which their Lordships have always manifested, directed that a set of Tables shall be computed and formed agreeably thereto. The Report will appear in the forthcoming volume of the *Memoirs of the Society*.

It was also noticed in the last Report, that, in consequence likewise of a communication from the Lords Commissioners of the Admiralty, the Pendulum Experiments of the late Captain Foster had been placed in the hands of a Committee, with a view to obtain results from them. The computations have necessarily taken

much time; but the Council are happy to state, that the whole of them are now completed, and only require to be fairly copied out in a regular series. The Report will then be drawn up with all convenient expedition, and forwarded to Government as early as possible.

The Council regret that the Standard Scale, mentioned in their last Report, has not been finished. It is a work that necessarily takes much time, due attention being requisite to the minutest points which are likely to affect its accuracy. Whilst on this subject, the Council cannot omit noticing a public document laid on the table of this Society at their last Ordinary Meeting, which contains several new and interesting comparisons of two of the principal European standards of length. This document is a Report on a Comparison of Weights and Measures, made by our Associate Mr. Hassler, to the Congress of the United States of America; and has arrived very opportunely, prior to the adjustment of the present standard.

The Council have much pleasure in noticing the favourable state of the finances of the Society, which will best appear from the following detail, deduced from the accounts accompanying the Auditors' Report now lying on the table: —

Receipts.	£.	*s.*	*d.*
Balance of last year*	201	8	8
Ditto of Charter Fund.....	129	18	10
1 year's divid. on 800*l.* cons.	24	0	0
Ditto on 1065*l.* 19*s.* new 3½ per cents.	37	6	0
Of Mr. Hawkins, for a silver medal for his private collection.....	0	19	0
On account of arrears.....	77	14	0
74 annual contributions...	155	8	0
1 composition.....	21	0	0
11 admission fees, and first year's contributions.....	44	2	0
3 non-residents who have become residents.....	8	8	0
Sale of Memoirs.....	24	13	6
	£724	18	0

Expenditure.	£.	*s.*	*d.*
1 year's rent of apartments	52	10	0
Lights, attendance, &c. at ditto.....	11	5	0
1 year's salary to Assistant Secretary	100	0	0
Engraving two plates, and printing impressions for Memoirs.....	17	2	6
Sundry disbursements for stationery, porterage, postage, &c.....	23	8	4
Collector's commission.....	15	16	6
Balance in Treasurer's hands, Jan. 26, 1833...	504	15	8
	£724	18	0

Assets of the Society.				£.	*s.*	*d.*
Balance in the Treasurer's hands				504	15	8
Arrears, Jan. 26, 1833: —						
2 contributions of six years' standing	£25	4	0			
2 ——— of five ditto, and 1 admission fee.....	23	2	0			
3 ——— of four ditto	25	4	0			
2 ——— of three ditto	12	12	0	165	18	0
7 ——— of two ditto	29	8	0			
19 ——— for the year just expired.....	39	18	0			
1 ——— at 4 guineas } 2 ——— at 3 guineas } for new Fellows.....	10	10	0			
Carried forward.....				£670	13	8

* This balance was erroneously printed 211*l.* 8*s.* 8*d.* in the last year's accounts; and the amount of stationery, &c. only 9*l.* 10*s.* 6*d.* instead of 19*l.* 10*s.* 6*d.*

Brought forward	£670	13	8
1865*l.* 19*s.* stock, valued at about	1700	0	0
Various astronomical instruments, books, prints, &c.			
Unsold Memoirs			
14 unappropriated silver medals			
A sum due by Messrs. Priestley and Weale for Memoirs sold, against which they have an account to set off for printing Memoirs, &c.			

As *one* mode of preventing the accumulation of arrears, and of relieving the Fellows of the Society from too frequent intrusion at times when they may be otherwise occupied, the Council suggest the advantage and convenience which would arise if the several Fellows of the Society, who are annual contributors, would direct their bankers (by means of a printed order, which will be provided for such purpose) to pay the annual contributions as they become due, until countermanded. This will prevent much delay and inconvenience which now attend the annual adjustment of the accounts.

The Balance of the Fund subscribed for the purpose of obtaining the Charter, has been paid by Mr. Baily to the Treasurer of this Society, agreeably to the Resolution of the Subscribers at a General Meeting. The amount was 129*l.* 18*s.* 10*d.*, as stated in the Auditors' Report of the year just expired.

The state of the Society, as regards the number of its Fellows and the different classes into which they may be divided, may be best seen by the following summary annexed to the Auditors' Report, whereby it appears that the total number of Fellows and Associates is 320:—

	Compounded.	Annual Contributors.	Non-resident.	Honorary and Patron.	Total Fellows.	Associates.	Grand Total.
Feb. 1832	53	110	106	2	271	42	313
Since elected	...	14	...	...	14	1	15
Resigned	..	−3	...	...	−3	...	−3
Deceased	−2	−1	...	...	−3	−2	−5
Become resid.	...	...	−2	...	...	...	...
From non-resid.	...	2	...	...	...	...	...
Feb. 1833	51	122	104	2	279	41	320

Amongst the number of losses, by death, which the Society has sustained in the past year, the Council have to mention, with regret, the names of Mr. Groombridge and of two Associates, Professor Oriani and Baron Zach.

The late Stephen Groombridge, Esq., was well known for many years to this Society as one of the most laborious and intelligent of

our members, and a sincere and early friend to our Association, in the formation of which he took a prominent share.

In the year 1806, he became possessed of a splendid transit circle, of four feet diameter, (the workmanship of our celebrated Troughton), so well known by his name and the excellent use to which he applied it; and he immediately commenced the task of forming an exact catalogue of the stars as low as the 8,9 magnitude within 50° of the North Pole.

In this arduous undertaking he persevered with singular assiduity for ten years, and in the year 1816 had completed about 30,000 observations in right ascension, and the same number in declination, on this part of the heavens — a series almost without a parallel in the annals of modern astronomy.

But Mr. Groombridge was not inclined to be satisfied with merely registering his observations: he applied himself with equal industry to the harassing labour of reduction, on which ten years more were exhausted; until, in 1827, he suffered a severe attack of paralysis, from which he never completely recovered. During this period he had applied the reductions which depend upon refraction, as well as instrumental and clock errors, to *all the observations*, and had obtained the mean places of about one-third of the whole number; so that nothing more was required for obtaining the Catalogue, precisely as it would have appeared from his own hands, except to apply the corrections for aberration, nutation, &c., according to his own tables. A request for assistance in computation was made to the late Board of Longitude, and immediately acceded to; and on the dissolution of that Board, the Lords of the Admiralty continued the same aid, with the readiness which has always so honourably distinguished their Lordships. The Catalogue is completed and printed, and will be published very shortly — nothing being now left to be done, except the verification of one or two minor points and deductions.

In the course of these observations, Mr. Groombridge entered into a very elaborate inquiry upon the subject of astronomical refraction, the details and results of which will be seen in two memoirs printed in the *Philosophical Transactions* for the years 1810 and 1814. It would be out of place here to enter into any description of papers which have long been before the public, and which are doubtless well known to the present Meeting; but it is impossible not to notice with admiration the industry of the observer, and the number and delicacy of the observations on which his deductions are founded.

In 1820, Mr. Groombridge presented to this Society his Universal Tables for the Reduction of the Fixed Stars, which are published in the first volume of the *Memoirs* — an extensive, and at the time useful, collection, but which are now perhaps in a great measure superseded by the methods more recently adopted. They differ little in their bases from the formulæ adopted in the Society's Catalogue, and are the tables used in the reduction of his Catalogue of Circumpolar Stars.

In 1822, Mr. Groombridge presented to this Society observations of the Planets during the period of their respective oppositions in 1820, 1821, and 1822, with the computation of their geocentric latitudes and longitudes, which are printed in the second part of the first volume of our *Memoirs;* and, in 1826, a notice on the co-latitude of his observatory at Blackheath, printed in the second part of the second volume. Planetary observations by Mr. Groombridge, chiefly of the new planets, for 1807, 1808, and 1811, from 1812 to 1815, and from 1820 to 1823, are inserted in the Supplements to the *Berlin Ephemeris*, and are of great value for the theory of those planets; as at that time his instrumental means were at least equal to, if not more powerful than, those of any other observer in Europe. In the prosperity of this Society Mr. Groombridge always took a lively interest, and was, as long as his health permitted, an active Member of your Council; and though, in later years, his infirmities did not permit him to be present at our meetings, or to aid us with his advice, no one could be more sincerely respected for his astronomical talents and his individual kindness and sterling worth.

It is seldom that we have to lament a more useful lover of science than Francis Xavier von Zach. He was born at Pesth in Hungary, in 1754, of a noble and distinguished family, and from his very childhood indulged in an ardent pursuit after knowledge, which, aided by an equally strong constitution and mental power, he continued to the day of his death. The striking phenomenon of the transit of Venus in 1769, with the appearance of a comet the same year, directed his youthful assiduity towards astronomy, and those branches of science most connected with it.

Having completed his education, the Baron was anxious to visit the various seats of learning; and, arriving in England, he was received in a flattering manner by the Earl of Egremont and other distinguished persons. It was thus that he became critically acquainted with the language, literature, and state of science in this country. A permanent employment being now desirable, he prevailed on the reigning Duke of Saxe-Gotha to erect a substantial observatory for him, at Seeberg, in 1786, where a series of observations, a Catalogue of 381 Stars, a Catalogue of 1830 Zodiacal Stars, his Solar Tables, and those on Nutation and Aberration, evinced an indefatigable observer and able computer, and placed his name in the first rank of German astronomers. When Ceres was lost sight of, after its first discovery, he was so persuaded of its planetary rather than cometary nature, that he persisted in searching for it, till his endeavours were crowned with success, and he thereby laid the foundation for detecting the other small planets. This was accomplished while he was also completing a map of Thuringia, from an actual survey, for the King of Prussia. Yet these labours had not altogether absorbed his active mind: struck with the advantages of a correspondence which might, in some degree, unite the mathematicians of all countries, he determined, in 1798, to edite an Ephemeris at Weimar, which in a couple of

years ripened into the well-known periodical work entitled *Monatliche Correspondenz.*

In 1814, Baron von Zach published his *Attraction des Montagnes,* in which he attempted to determine the effects of attraction on the plumb-line by a chain of astronomical and geodesial operations, which he had carried on in the preceding year at Marseilles.

Accompanying her serene highness the Duchess of Saxe-Gotha into Italy, where he made numerous celestial observations, he settled for some years in a delightful villa in the eastern suburb of Genoa. Here his first care was to raise a small observatory, and to recommence publishing his *Correspondance;* which, that it might be still more widely available than the former, he printed in French. This work treated of astronomy, geography, hydrography, and statistics; and although conducted with the lively discursive freedom so peculiar to the Baron, it leads to many points of the most abstruse and transcendental inquiry, and moreover has the merit of submitting the whole type of mathematical analysis, instead of abruptly giving mere conclusions — the fault of so many scientific journals.

It is needless to mention the cause of the Baron's unexpected removal from Genoa in 1826, and the general loss which the stoppage of his work occasioned; for about this time a painful complaint rendered application to Dr. Civiale, of Paris, so absolutely necessary, that he took up his abode in that city. There, even while suffering under repeated surgical operations, his animation never flagged; and to the last his natural exuberance of spirits was ever at hand, to relieve the earnestness of discussion. At length, by the skill of the operator, his agonising disease latterly allowed him such intervals of comparative ease, that he even entertained thoughts of revisiting England in the ensuing spring, when he was suddenly attacked by that new and insidious disease the cholera, and died on the 2d of last September, after an illness of only twenty hours.

The Baron was a member of most of the scientific institutions in Europe, a Counsellor of State and Chamberlain of the Court of Saxe-Gotha, and a Knight of the Royal Order of the Black Eagle of Prussia. There are few persons of the age who are likely to be more regretted by the numerous friends to whom his talents, vivacity, sociability, and agreeable manners, had endeared him.

Count Barnaba Oriani, many years Director of the Imperial Observatory of the Brera at Milan, was born at Garegnano, near that city, in 1753. At an early age he removed to the capital, where he soon distinguished himself by a predilection for mathematics and mechanical philosophy. In 1786 we find him conducting the trigonometrical operations for measuring an arc of the meridian over Lombardy. He afterwards continued the Ephemeris so ably begun by La Grange, and inserted in it many able and valuable dissertations on the Lunar Theory, on Refraction, and various abstruse practical and theoretical *desiderata;* whilst his skill in *spheroïdal* trigonometry enabled him to be the first in computing the path and perturbations of Ceres.

Oriani was long known in the scientific circles as the abbate and professor; but he was afterwards much noticed by Napoleon, and presented with the decorations of the Legion of Honour and of the Iron Crown; he was also elected a senator of the kingdom of Italy, and finally acquired the title of count. In private life he was of a pleasing and amiable disposition, and a great encourager of study amongst the youths of his acquaintance. His death, which happened on the 12th of last November, was universally regretted; but it is a consolation to the scientific world, that the lamented philosopher has been succeeded at the Brera by his worthy coadjutor the distinguished Carlini. The following tribute to his memory is from one that knew him intimately — the celebrated Plana, of Turin, who, in the preface to his elaborate *Treatise on the Theory of the Moon*, recently arrived in this country, has the following passage:—"His splendid talents, by which he has rendered illustrious not only the Observatory of Milan, but the whole of Italy, made him highly respected, and caused his loss to be seriously deplored. Honoured with his confidence and his friendship, I could not but admire the purity of his conduct and the nobleness of his character. His modesty enhanced his talents; and the feeling of jealousy for the acquirements of others was to him unknown. No man was more indifferent than M. Oriani to those honours and dignities which had elevated him to the higher classes of society; for the philosopher remained faithful to his principles and his habits; and nothing could suppress his ardour for study, or overcome his inclination for retirement."

The instruments belonging to the Society are disposed as follows:—The Lee Circle is in the hands of our excellent Foreign Secretary, Captain Smyth, of Bedford, and is placed in his observatory, which may be considered as a model of all that a working astronomer's observatory should be. The Beaufoy Circle and Clock are with the Rev. Michael Ward (from whom the Council has received some observations); and the Wollaston Telescope is with Thomas Maclear, Esq., of Biggleswade, to whom this Society has so often and so deeply been indebted for his valuable computations and observations. Mr. Maclear has very recently forwarded a copious list of occultations of stars by the Moon, and of the eclipses of Jupiter's satellites during the last year; and your Council are happy to acknowledge in him one both able and willing, notwithstanding the duties of a laborious profession, to supply the heavy loss sustained by the science in this country, from the death of the lamented Colonel Beaufoy, and the departure of Mr. Henderson to the Cape of Good Hope. Mr. Maclear has now placed his telescope under a rotatory roof; and though scarcely any additional accuracy in his observations can be expected, yet the facilities thus acquired will doubtless relieve him from much of the pressure and tedium of observation.

The Beaufoy Transit is with Mr. Jones, of Charing Cross; and the Clock with Rowland Hill, Esq., for the purpose of making some delicate observations.

A very important addition has been made, in the course of the past year, to the Society's stock of instruments, by John Fuller, Esq., of Rose Hill, a Member of the Society, and a gentleman well known for his great liberality and love of science. This is a repeating theodolite, of twenty inches diameter, made by Mr. Thomas Jones, of Charing Cross, with three microscopic readings, and divided after Mr. Troughton's method — the first trial made by Mr. Jones of this essential improvement in dividing. The upper works resemble, in a great degree, those of the great theodolite by Ramsden, well known from the account given of it in the *Trigonometrical Survey;* and the reversible telescope, which has thirty inches focal length, may be used very conveniently, on a separate stand, as a transit, and is, indeed, fitted up for that purpose. There are several peculiarities in the construction of this instrument, which it is not the place here to describe minutely; but the workmanship and contrivances seem worthy of the high reputation of the artist, and the whole instrument is in as perfect a condition as when it issued from the workshop in 1813.

Your Council have also to return their thanks, in your name, to Captain W. F. W. Owen, R.N., for a double reflecting circle, of his own construction, and a quadruple reflecting sextant after a Dutch model — both executed by Mr. Thomas Jones, of Charing Cross. These instruments are rendered the more valuable by an accompanying description of their purposes and advantages from that accomplished navigator himself; and your Council most heartily join him in his hope, that by these and similar principles, reflecting instruments (which are all-important to our maritime interests) may be carried to a still higher degree of perfection than they now possess.

The other instruments, not in use, are at the disposal of the Council, to be lent to such Fellows of the Society (under the usual printed conditions) as may be desirous of using them; and the Council would have much pleasure in seeing them usefully employed.

In addition to the two presents of instruments just mentioned, the Council have to notice another interesting and valuable present; viz., a manuscript copy of the Astronomical Observations made at the Royal Observatory of Greenwich, by Dr. Edmund Halley, from the year 1719 to 1739, presented by the Right Honourable the Lords Commissioners of the Admiralty. The original observations are contained in four small quarto volumes deposited in the library of the Royal Observatory, and have never yet been printed. They are badly written, and consequently not readily to be referred to or examined; added to which, there is a constant risk of damage, or total loss, by fire or other accident. A representation of these circumstances was made by Mr. Baily, through the medium of Captain Beaufort, to the Lords Commissioners of the Admiralty, and a desire expressed that a fair and legible copy should be made of the whole. Their lordships, justly appreciating the utility of such a measure, and desirous of promoting so laudable an object, imme-

diately gave directions for the execution of the work; and it is now deposited in the library of this Society.

The thanks of the Society are justly due for each and all of these presents; in which sentiment the Council are persuaded that this Meeting will cordially join.

The Council cannot, however, leave this subject without alluding, in terms of great approbation, to the kind offer of your Treasurer, Dr. Lee, and of Lieutenant Raper, to examine and compare the MS. copy above mentioned with the original MS.; a measure which will tend to enhance its value, and render any damage to the original (if ever such should unfortunately happen) of much less moment.

Another offer, of considerable importance, and of great practical utility, has been made to the Council by Mr. Stratford, the Superintendent of the Nautical Almanac; namely, to furnish the Society, for the use of its Fellows and others interested in the subject, with a *working Ephemeris*, for the ensuing year 1834 (and it is to be hoped for the subsequent years), containing all the various phenomena connected with the sun, moon, and planets, to which it is desirable the practical astronomer should attend; arranged in the order of time, as they severally occur throughout the day, and computed for the meridian of Greenwich. A work of this kind has long been a desideratum in the observatory; and the Council have cheerfully undertaken to defray the expense of printing the same, when they are furnished with the manuscript copy.

In the Report made at the last Anniversary, it was stated that an Ephemeris of the position of Mars for his next ensuing opposition had been drawn up, and circulated amongst the different astronomers of Europe, with a view to induce them to make corresponding observations with Mr. Henderson, then about to sail for the Cape of Good Hope, who had undertaken to make special observations on this planet, for the purpose of determining its parallax. This pledge has been redeemed; and the Council are happy in being able to state, that they have recently received from the Lords Commissioners of the Admiralty a series of regular observations connected with this subject, commencing on the 11th of October last; together with a variety of valuable observations on other points, which shew the zeal and talent with which this indefatigable astronomer has entered on the arduous duties of his office. In noticing these documents (which will be laid before the Society in their regular course), the Council cannot avoid adverting once more to the readiness with which their lordships have communicated these interesting papers — at once a proof of their attention to the interests of science, and of their desire to promote objects immediately connected therewith.

Relative to the distribution of materials for promoting the objects of this Society, your Council have to state, that, agreeably to his Majesty's warrant, the Council of this Society (as well as the Astronomer Royal, and the Council of the Royal Society) have now the privilege of being supplied with as many copies of the *Green-*

wich Observations as they may desire, to distribute for the benefit of science. Keeping this object in view, and having before them a list of the persons and institutions to whom the Royal Society have already voted copies, your Council have formed a list of additional names of persons and institutions to whom they consider such copies should be presented; and it is hoped that, between the two lists, no name has been omitted which ought to be inserted. As the list, however, which will be published in the ensuing volume of the *Memoirs*, is always open to correction, your Council will be happy to receive any suggestions for its enlargement.

The Council regret that the Fifth Volume of the Memoirs, which has been for some time in the press, should have been so long delayed. It was expected to have been laid on the table this day: but the Council must request a further indulgence of a few weeks.* The delay has arisen from circumstances over which the Council had no control. As the papers have, of late, considerably increased, it is proposed by your Council that in future the distinction of *Parts* shall be discontinued; and that each published portion of the Memoirs shall be a separate and distinct *Volume*. The Council, anxious to meet the wishes of those Fellows who may be desirous of procuring the several papers as fast as they are printed, hope also to be able to make arrangements whereby any Fellow, on depositing the estimated value of the Volume with the Publisher, may be furnished with *each sheet* of the Volume immediately on its being printed.

Amongst the printed works presented to the Society in the course of the past year, the Council notice, with great satisfaction, the "Description of the Measure of a Degree of Latitude in the Eastern Provinces of Russia," by Professor Struve, one of your Associates. Though inferior in length to the extensive lines measured by the English in India, and by the French in France and Spain, this measurement particularly deserves our attention for the novelty of the methods, both in observation and in calculation, and for the extreme care taken to insure all possible accuracy. It appears that the first idea of this measure was suggested by a survey of Livonia, (for the purpose of mapping), made by M. Struve, in 1816–18. In 1819, the plan of a meridian survey was laid before the Russian authorities, and in 1820 preparations were made by the purchase of instruments, and the preliminary examination of the country. The employments of the Observatory, and impediments of various kinds, prevented M. Struve from seriously commencing the Observations till 1823; and the base was not measured till 1827.

The amplitude of this arc is about 3° 35′, extending from the small town Jacobstadt, on the Düna, to the island Hochland, in the Gulf of Finland. These are connected by twenty-nine principal triangles, and two small ones; three small triangles also being necessary to connect the base with the grand chain. The Ob-

* This volume has since been published, and may now be had at the booksellers'.

servatory of Dorpat is near the middle of the arc. The base was measured with iron rods of two toises each, which had been compared with a toise whose length, as certified by M. Arago, had been adjusted by that of the toise of Peru. The difficulty of producing contact of the rods without disturbance has often been felt; it was obviated here by providing each rod with a *fühl-hebel*, or multiplying lever. Corrections were applied for temperature, flexure, &c.; the base was measured but once, but M. Struve thinks repetition is not necessary. The horizontal angles were measured with Reichenbach's universal instrument, which is a sort of theodolite, the horizontal axis serving also as a diagonal eye-piece: the same instrument was used to determine, by observations of Polaris, the azimuths of sides terminating at Jacobstadt, Dorpat, and Hochland. The latitudes of the extreme stations were found by the use of two 18-inch circles by Reichenbach, in the usual way (rejecting repetitions); all possible corrections being applied for the flexure of the telescope, &c. But the principal reliance was placed on a method proposed by Bessel, but never before extensively used, namely to place a transit instrument with its axis N. and S., and thus to observe the transits of well-known stars over the prime vertical. The triangles were calculated by Legendre's method; but the terrestrial arc of meridian by a method proposed by Bessel, and differing entirely from any that had been used before. Instead of referring the stations to the meridian by parallels and perpendiculars, they are all referred to the Observatory of Dorpat by a sort of polar co-ordinates, the distance from Dorpat being the radius vector, and the azimuth at Dorpat being the polar angle.

Our admiration of the talent and industry displayed by M. Struve in this important measure, will be greatly increased when we recollect that the principal part of the Observations in the Dorpat publication, and the whole of the Observations on which the *Catalogus Novus* is formed, were made during the intervals of the labours of this survey. M. Struve hopes that, though difficult, it may yet be possible to extend the arc both to the north and to the south; in the former case, the celebrated Lapland degree would be joined; in the latter, several mapping surveys in Russia and Prussia would be added to the fundamental arc.

It has long been wished that a set of rules or directions should be drawn up for the use of observers, both in fixed and movable observatories, as well as for travellers who, with more limited means, might occasionally have opportunities of making observations which would be interesting to science; such as for determining the latitude or longitude of a place, the position of a comet, &c.; and adapted not only to those who travel in the civilised parts of the world, but also for those who, in exploring barbarous countries, may frequently be obliged to carry, and even to conceal, such instruments. But, however simple, at first sight, such a plan may appear, it is by no means an easy task to devise a set of instructions which shall be so generally applicable as to include the manipulation and use of the various instruments which may be recommended or employed on

such occasions, and suited to the several degrees of information possessed by individuals who may require them. A committee, however, has been appointed to report on this subject, and the Council would be happy to receive any hints that may tend to perfect the plan proposed.

At the last Annual General Meeting a notice was given by one of the Fellows, that he should propose at the present meeting such an alteration of the Bye-laws, as would authorise the proposal, ballot for, or admission of, candidates, at an annual general meeting of the Society, in the same manner as at an ordinary meeting. The Council have taken the subject into consideration, and now recommend for your adoption the following additional bye-law: —

"*That notwithstanding any thing in the Bye-laws to the contrary, persons desirous of becoming Fellows, may be proposed, balloted for, or admitted, at any Annual General Meeting, as at an Ordinary Meeting.*" *

Should this proposal have the sanction of the present meeting it will be acted upon immediately.

The last subject which has occupied the attention of your Council, has been the annual appropriation of the medal of the Society. In making the selection from the names submitted to them for this honorary reward, the Council feel assured, that in awarding it to Professor Airy, for his paper "On the inequality of long period in the motions of the Earth and Venus," they will receive the concurrence and approbation of this meeting, and be fully justified in the opinion of the scientific world. The medal will be presented this day, in the usual manner, from the chair.

Titles of the Papers read before the Society, between February 1832 *and February* 1833.

March 9, 1832. A Letter from Mr. Snow on the Occultations of 119 and 120 Tauri, and of Regulus.

Observations of the Comets of 1830 and 1831 by different Observers. Collected by Baron Zach, and communicated by Mr. Snow.

Emersion of Aldebaran on Feb. 10, 1832. By the Rev. M. Ward.

A List of Stars observed with the Moon at Blackheath, from August 1831 to January 1832. By Mr. Wrottesley.

Observations made by Lieut. Johnson at the East India Company's Observatory at St. Helena.

A Paper on the Planetary Theory. By Mr. Lubbock.

A Paper on the Rotation of the planet Venus. By the Rev. Mr. Hussey.

* This bye-law was proposed, and unanimously adopted by the meeting.

Observations on the Magnitudes of Stars. By Mr. Birt; communicated by Mr. Lubbock.

A List of Stars observed with the Moon at the Royal Observatory, Greenwich, in January and February 1832. By Mr. Pond.

Occultations and Stars observed with the Moon at the Observatory, Cambridge, in Jan. and Feb. 1832. By Prof. Airy.

April 13. Comparisons of the Right Ascension of Polaris, as obtained by Observation, with that given in Bessel's Catalogue for 1831; and Observations of λ Ursæ Minoris and 51 (Hevelius) Cephei, made with a 5-feet Transit at Blackheath. By Mr. Wrottesley.

This evening Mr. Sheepshanks gave an account of the Mural Circle, with the methods of using it hitherto followed, and a description of the state and defects of the Circle at the Cape Observatory; illustrating his remarks by a model of a Mural Circle lent for the occasion by the Council of the London University.

A List of Stars observed with the Moon at the Royal Observatory, Greenwich, in March 1832. By Mr. Pond.

Transits of the Moon with Moon-culminating Stars observed at Cambridge, in May 1832. By Prof. Airy.

This evening Mr. Baily stated in reference to Dr. Robinson's paper, "On the Dependence of a Clock's rate on the height of the Barometer," read in June last, that he had recently swung the mercurial Pendulum in a vacuum apparatus, and found that a variation of one inch in the pressure of the atmosphere produced a difference of 0,42 seconds a-day in the rate of the Pendulum; which is more than double the quantity deduced by Dr. Robinson from the *observed* alteration of rate when compared with the height of the barometer.

May 11. On the Transit of Mercury which took place on the 5th May, 1832. By the Astronomer Royal; by Mr. Simms, of the Royal Observatory; and by Mr. Riddle. Also Observations of the same at the Observatory, Exchequer Street, Dublin, and measures of the Planet's diameter by Mr. Simms, Fleet Street.

Observations of the Occultation of Saturn on the 8th May, 1832. By Mr. Riddle; by Mr. Simms; by Capt. Smyth; and by the Rev. Mr. Ward.

Observations of the Occultations of 119 and 120 Tauri, on March 9, 1832, at Islington. By Mr. Simms.

Corrections of the formulæ for determining the Longitude from an observed Occultation, with suggestions for simplifying the application of these and other formulæ to the case of corresponding Observations. By Mr. Riddle.

Observations of the Eclipses of Jupiter's Satellites, and Occultations between the years 1827 and 1832, and

measures of Double Stars taken in 1831 and 1832. Also, Observations of the Comet of Ophiuchus, in January 1831. By the Rev. W. R. Dawes; communicated by Sir John Herschel.

A new Method of reducing the Apparent Distance of the Moon from a Star to the true Distance. By Baron Zach.

A Method of finding the rate of variation of the Moon's motion at any instant. By Lieut. Raper, R.N.

On the Determination of the Sun's Parallax, from Observations of the Transit of Venus, June 3, 1769; a posthumous work of Don Joseph Joachim de Ferrer; followed by a Summary by Don Joseph Sanchez Cerquero. Communicated by Sir James South.

An Ephemeris of Encke's Comet for the Southern Hemisphere. By Prof. Encke; communicated by Lieut. Stratford, R.N.

A List of Stars observed with the Moon at the Royal Observatory, Greenwich, in April 1832. By Mr. Pond.

Observations of the Moon and Moon-culminating Stars made at Cambridge Observatory, in April 1832. By Prof. Airy.

June 8. Observation of the Transit of Mercury on the 5th May, 1832, at Lisbon. By the Rev. J. Fisher; communicated by Capt. Beaufort.

Observations of the Occultation of Saturn on 8th May, 1832. By Mr. Lawson, by Mr. Holehouse, and by Mr. Snow.

Observations of the Solstices from December 1829 to December 1831; and Observations of Moon-culminating Stars during the year 1831, made at the Hon. East India Company's Observatory, St. Helena. By Lieut. Johnson; communicated by Capt. Beaufort.

On the Calculation of the Geographical Longitude and Latitude of a place, whose geodesic distance from the Meridian and perpendicular of another place is given, the Earth being considered as a spheroid. By Baron Zach.

Mean Right Ascensions of Fifty-five unknown Stars, observed in 1831, with a Transit Instrument of 20-inches focus, and a sidereal Chronometer beating half seconds; also Occultations observed in March 1832. By Mr. Snow.

Fifth Catalogue of Double Stars observed at Slough in the years 1830 and 1831, with the 20-feet Reflector, and reduced to the Epoch 1830,0. By Sir J. F. W. Herschel.

Observed Occultation of Aldebaran. By Mr. Rothwell; communicated by Mr. Tulley.

Stars observed with the Moon at the Royal Observatory, Greenwich, in May 1832.

This evening Mr. Sheepshanks made some remarks upon the mode of adjusting the Transit Instrument, and described minutely the various corrections requisite for obtaining correct results, illustrating his statement from various Transit Instruments furnished for the occasion by Messrs. Troughton and Simms.

Nov. 9. Observations of Biela's Comet, by Sir J. F. W. Herschel; with interesting remarks on the appearance of the Comet.

On the method of ascertaining the rates of Chronometers; especially when a strict examination of their performance is required. By Mr. Epps, Assistant-Secretary of the Society.

Observations of the Transit of Mercury on May 5, 1832. By Prof. Quetelet, at Brussels; by Mr. Henderson, at the Cape of Good Hope; by Capt. Bayfield, lat. 46° 48′ 50″ N., long. 71° 16′ W.; by Capt. R. Owen, R.N., lat. 22° 47′ 20″ N., long. 74° 18′ W.; by Capt. Belcher, R.N., at Cavalho Island, Bijoogas; and by M. Cacciatore, at Palermo.

Observations of the Occultation of 104 Tauri, October 13, 1832, and of μ Ceti, Nov. 7, 1832. By Mr. Snow. Accompanied by the Transits of the Stars used to correct the Clock.

Observations of the Occultation of Saturn, May 8, 1832. By Prof. Airy and Mr. Maclear at Cambridge, and by M. Cacciatore at Palermo.

Stars observed with the Moon at the Royal Observatory, Greenwich, in June, July, and August, 1832. By Mr. Pond.

Observations of the Transits of the Moon with Moon-culminating Stars, made at Cambridge Observatory in August, Sept., and October, 1832. By Prof. Airy.

Dec. 14. Extract of a Letter from Prof. Santini to Prof. Airy, containing Observations of Biela's Comet.

Various Observations made at the Observatory of St. Helena, by Lieut. Johnson; consisting of

1. Observation of Stars with the Moon from March to July 1832.
2. Observation of the Solstice of June 1832.
3. Observation of the Solar Eclipse of 27 July, 1832.

Investigation of a rule for clearing the apparent distance of the Sun and Moon from the effects of parallax and refraction. By Charles Blackburn, Esq.

Observation of the Transit of Mercury on May 5th, 1832, and of the Occultation of Saturn on May 8th, 1832, made at Utrecht. By Prof. Moll.

Remarks on the 5th Catalogue of Double Stars, communicated to the Society June 7, 1832. By Sir J. F. W. Herschel.

Stars observed with the Moon at the Royal Observatory of Greenwich, in October and November 1832. By Mr. Pond.

January 11, 1833. Observations of the Solar Eclipse of 27th July, 1832, made at St. Fernando. By M. Cerquero.

Observations of the Transit of Mercury, May 5th, 1832, at St. Fernando. By M. Cerquero.

Observation of Stars with the Moon at the Cambridge Observatory, in November and December 1832. By Prof. Airy.

Observations of Biela's Comet, and deduced Elements, by Prof. Nicolai, of Mannheim. In a Letter from M. Olbers to Sir J. Herschel. Communicated by Sir J. Herschel.

List of Public Institutions, and of Persons, who have contributed to the Society's Library, &c. since the last Anniversary.

The Lords Commissioners of the Admiralty.
Royal Society.
Royal Asiatic Society.
Royal Society of Edinburgh.
L'Académie Royale des Sciences de l'Institut de France.
Le Bureau des Longitudes.
Cambridge Philosophical Society.
Academy of Sciences at Dijon.
Italian Society at Modena.
American Philosophical Society at Philadelphia.
Society of Arts.
Society of Physics and Nat. History at Geneva.
Geological Society.
Zoological Society.
Editor of the Athenæum.
Editor of the United Service Journal.
British Association.

Professor Airy.
Professor Argelander.
Professor Bessel.
Professor Bowditch.
Professor Cacciatore.
M. Cerquero.
M. Corabœuf.
Professor Encke.
John Fuller, Esq.
Professor Gauss.
Stephen Groombridge, Esq.
Professor Hansen.
Professor Hassler.
M. Marcoz.
Captain W. F. W. Owen, R.N.
Messrs. Parkinson & Frodsham.
M. Plana.
Professor Quetelet.
Dr. Robinson.
Charles Rumker, Esq.
Professor Schumacher.
Charles Shearman, Esq.
William Simms, Esq.
Professor Struve.
Richard Taylor, Esq.
Rev. Mr. Whewell.

(The Vice-President then addressed the Meeting on the subject of the award of the Medals, as follows:—)

It now becomes my pleasing duty to deliver, from this Chair, the Medal which has been awarded by your Council. But, previously to my so doing, I beg leave to say a few words on the subject to which that medal relates: a subject, which is perhaps amongst the most abstruse and refined of any to which the human mind can aspire.

When Newton published that important work on the mechanism of the heavens, which has rendered his name immortal, he probably was not aware of the full extent and influence of those sublime truths, and those new views which he had laid open with so much penetration and skill. Vast as were the resources of his clear and powerful mind, there were still some parts of the system left untouched by him; some subjects with which he would not, at that period, undertake to grapple. With a firm and masterly hand he had sketched a bold and beautiful outline, and even filled up, in the same skilful manner, all the prominent and many of the more minute points of the picture: still, however, leaving some of the finer touches to be supplied by those who might succeed him.

Amongst the less perfect parts of the system developed by Newton, may be reckoned that which relates to the cause of certain small irregularities or disturbances in the motion of the *Planets*. Yet such was the respect paid to the authority of his great name, so vastly superior was he to any of his contemporaries, that nearly 60 years elapsed before there was an attempt to make any material additions to that splendid edifice, the foundations of which he had laid with such consummate skill. The first that ventured to approach this sacred temple, not for the purposes of attack, but to improve, was Clairaut; who may be considered, after Newton, as the first that investigated the method by which the cause of the planetary disturbances is explained, and their effect computed.

If, in our view of any portion of the solar system, we confine our attention to the case of *two* bodies only, revolving round each other (such as the sun and a planet, or a satellite and its primary) the two great truths first developed by Kepler, viz. the equable description of areas and the elliptical form of the orbit, would be strictly preserved: and by the help of certain elements determined by observation, the place of the revolving body could, under such circumstances, be readily ascertained, for any given moment of time, without much difficulty.

But, if a *third* body be brought within the sphere of their influence (and let the number be ever so great, the investigation is necessarily confined to this simple consideration), the case is very materially altered, and becomes extremely complicated; and that which before admitted of a comparatively easy solution, now becomes one of the most difficult problems that ever exercised the talent and ingenuity of the most profound mathematician: a problem which, for the sake of distinction has been denominated

the *Problem of three bodies;* a term applied, by common consent, to that investigation wherein it is required to find the laws of motion, the magnitude, form and inclination of the orbit of a body revolving round another as a centre, but disturbed in its motion and position by the influence of a third body at a distance. As every moving body in the system is thus circumstanced (since each is subject to the action of every other body in the universe), it is evident that this problem is of very extensive application and of great difficulty: and its solution has consequently been the object of the most acute and profound geometers from the time of Newton to the present day.

The problem, indeed, does not admit of a rigorous and accurate solution; and can only be solved by approximation, founded on investigations of the most abstruse and difficult nature. But, the amount of the perturbations is fortunately very small, which tends to facilitate the inquiry; as we are thus enabled to preserve the simple case of *two* bodies, as a preparatory step to the consideration of the subject: since its results, with some slight modifications, belong to it. For, in the words of an eminent professor,* "an exact ellipse is described only when there are *two* bodies; and a curve, differing but little from an ellipse, when there are *three* or more bodies. The coincidence of the curve, described in the first instance, with a simple curve of known properties, has been the cause why the elliptical motion of a planet is considered as its natural and proper motion: and, accordingly, (in order that there might be no incongruity of language) why a third is called a *disturbing* body; for its action obstructs the operation of the laws of elliptical motion. This however (as is evident) is mere mathematical fiction and contrivance. An ellipse is not the curve that is really described: but that curve is described, the equation of which is assigned by the solution of the problem of three bodies."

Now, when we consider the variety of circumstances in which any two, or more, planets, influencing each other, may be placed, with respect to the direction of their motions, the inclinations of their orbits, and their mutual distances; that almost every part of the elliptical system is thereby disturbed, such as the positions of the planets in their orbits, their inclinations, aphelia, and nodes; and when we further reflect, that all the planets in the system are exercising their influence on each other, and thus more or less disturbing the motions and positions of the whole; when these and other points of equal intricacy (but which cannot conveniently be enlarged upon in this place) are taken into consideration, any person, not even professing to be conversant with the more refined branches of analysis, may readily *imagine* the difficulties to be encountered in obtaining only an approximate solution of the important problem above alluded to. Whilst those who are better versed in the subject, and claim a more perfect acquaintance with the higher branches of mathematics, *know* too well the arduous task of even following,

* Woodhouse.

much more of verifying, the various steps of the investigations made by the great masters that have preceded them.

I have already remarked that Clairaut was, under Newton, the first who attempted to investigate the laws, by which the planetary disturbances are governed. Newton himself, although he pointed out the road, did not specially enter on the subject; probably considering the quantities too minute. From that period to the present day, the list is but small, of those who have ventured to attack this profound and intricate inquiry. Clairaut, D'Alembert, and Euler, may be considered as the founders of the *planetary theory*: a term given to that investigation which, whilst it determines the elliptical place of any given planet, points out not only the perturbations caused by the action of the other planets, but also the variations produced by such perturbations, in its position, and in the dimensions of its orbit.

In these investigations, it is impossible for the mathematician to take into account all the quantities that arise in the several steps of the process, or to retain them for computation: some must necessarily be rejected, or rendered more simple by various contrivances, not solely at the mere will of the analyst, and for his own convenience, but from the absolute insufficiency of the means of computing them. And it is no easy consideration to determine what terms ought to be rejected and what should be retained; since no rules can be previously laid down for the limitation: and the decision must depend on the form which they assume *after* integration. In the pursuit of this inquiry, the distinguished mathematicians, above mentioned, have had recourse to various methods of approximation, founded on the most abstruse and intricate parts of the differential and integral calculus.

Even after all the labours of these great men, and after they had reduced the perturbations of the planets to something like a regular system, agreeing tolerably well with observation, there still remained an unexplained anomaly in the motions of *Jupiter* and *Saturn*, which had long perplexed the astronomer, not only from its magnitude, but more especially from its not being reducible to any of the known principles deduced from the theory of gravitation. It was long known that the mean motion of *Saturn* was retarded, whilst the mean motion of *Jupiter* was accelerated: and the amount of this mutual variation was too great even to escape the observation of the more ancient astronomers. How much therefore must it have perplexed the mathematician to find that such an obvious anomaly was not only inexplicable on the theory so recently developed by Newton, but evidently impugned that theory: an advantage that was readily seized by his opponents.

Euler had attempted the investigation of this subject; but he experienced so many difficulties in the pursuit, and his results accorded so little with observation, that he ultimately abandoned the design. La Grange also took up the inquiry; but at first, with imperfect success. In the mean time La Place, to whom every branch of physical astronomy is so highly indebted, directed the resources of his powerful and sagacious mind to the elucidation of

this intricate subject: and in his first essay succeeded so far as to shew that the disturbances of these two planets were not of a *secular* nature, but that they must necessarily be *periodical:* a result in which he was confirmed by the investigations of La Grange. This deduction was a great step towards the solution of the problem, since it in some measure contracted the inquiry, and indicated that the inequality was one of *long period*, and to be sought for in the general analytical expression for the problem of three bodies. At length La Place detected the true cause of the apparent anomaly above alluded to, as I shall now proceed to shew.

In forming the differential equation expressing the conditions of the disturbed body, the terms that involved the third and higher powers of the excentricities, had generally been rejected on account of their presumed minuteness. But amongst these rejected quantities, it occurred at length to La Place, that there might be some which, if integrated, would have very small divisors, and consequently become of an appreciable value. To follow out all these terms would be a truly Herculean task, which might not be repaid by the labour of the inquiry. The genius of that illustrious geometer, however, penetrating through this labyrinth of interminable calculations, enabled him to limit the inquiry: and after much laborious research, he found a clue to the principal object he had in view. For he ascertained that, in consequence of the near commensurability of the mean motions of *Jupiter* and *Saturn* (which are nearly as 5 to 2), those terms only, in the resulting expression, need be retained, which, after integration, admitted in their denominator a quantity depending on five times the mean motion of *Saturn*, minus twice the mean motion of *Jupiter;* and that, in the expansion of the series, the investigation need not be extended beyond those terms where the co-efficients are of the third order, or such as are indicated by $(5-2)$: principles which we shall find extended to the investigations which form the subject of the present address.

Still the labour of reduction was immense, and sufficient to appal the most intrepid computist: but he was fortunately assisted by Burckhardt in his researches, who extended the terms to the 5th order. The result of the whole indicated a considerable inequality, of very long period; for his analytical expressions being reduced into numbers, he found that the great inequality of *Saturn* was $48' 44''$ and its period 919 years: that the corresponding inequality of *Jupiter* was comprised within the same period, but affected with a contrary sign, and diminished in the ratio of about 7 to 3: that the two inequalities were at their maximum ($+$ for *Jupiter* and $-$ for *Saturn*) about the year 1560: and that ever since that time the mean annual apparent motions of the two planets have been approaching the true mean motion, till the year 1790, about which time they were both equal: since which epoch they have been again diverging, but in a contrary order; all which are found to be agreeable to observation.*

* The values here stated are those first given by La Place; which have since been subjected to corrections by subsequent observations.

Thus it was shewn that these apparent anomalies in the motions of *Jupiter* and *Saturn*, which seemed at one time to impair the Newtonian system, have only tended more effectually to strengthen and confirm it. We here see, as in many other instances in physical astronomy, the practically good effects of theory: since it points out to us many objects of research which, from their minuteness would either be frequently overlooked by the mere practical observer, or become sensible and apparent only after a lapse of many years. In this respect it may be considered as no longer going hand in hand with observation, but as advancing before it, and serving it as a guide.

Such was the state of the planetary theory when Professor Airy in 1828 communicated to the Royal Society his paper "On the corrections in the elements of Delambre's solar tables." In that elaborate paper he detected certain anomalies in the motion of the sun, indicated by a laborious comparison of upwards of 1200 observations made at the Royal Observatory at Greenwich, and not explicable by the usual formulæ for planetary perturbations. And although he was at that time unprepared to demonstrate the origin and cause of those irregularities, yet, in the postscript to that paper, he expressed his firm conviction that they arose from an inequality of long period, depending (as in the case of *Jupiter* and *Saturn*) on the near commensurability of the mean motions of the *Earth* and *Venus*: or, on 13 times the mean motion of the *Earth*, minus 8 times that of *Venus*, and that its period was 240 years. The amount of the perturbation at its maximum, was indeed very small, not much exceeding two seconds of space: but this was at once a proof of the scrupulous accuracy of the inquiry, and of the refinement of modern observation.

To detect the true cause of this minute anomaly, Professor Airy, shortly after, resumed the inquiry; and in a subsequent paper read before the Royal Society, entitled "On an irregularity of long period in the motions of the *Earth* and *Venus*," he has given a detail of the methods by which he obtained the result in question: and it is for this paper that your Council have now awarded the Gold Medal of the Society.

In the course of his investigations he perceived that, although in the ordinary case of the planetary perturbations it had been usual to restrict the inquiry to those terms where the co-efficients were of the second order, and that although in the case of *Jupiter* and *Saturn* it might be limited to terms of the third order, yet in the present case it was requisite to extend them as far as the fifth order; or to such as were indicated by the near commensurability of the mean motions of the *Earth* and *Venus*; that is by 13—8. And although such quantities, in the differential equations, would be very small, yet in the integration and subsequent process they would receive a multiplier of 2,200,000; and thus become of an assignable magnitude. The labour of the investigation was therefore prodigiously increased; and we cannot but admire the patience and perseverance of Professor Airy, in having himself gone through the

Herculean task of computing the numerical values, and by two different modes, in order to insure the accuracy of the result. When, therefore, we consider the immense labour and difficulty of conducting an inquiry of this kind; when we bear in mind that such men as Euler and La Grange have been foiled in their attempts to elucidate a more prominent and striking case than the one in question; and that even the investigations of La Place (assisted, as they were, by Burckhardt) have been since found in some instances erroneous, and that they have required and received the correcting hand of some of the most eminent mathematicians of the present day; we may, without the labour of a minute inquiry, form some idea of the merit due to Professor Airy for having pursued this subject to so successful a termination.

The numerical result of the whole shews that the maximum amount of the inequality in the longitude of the *Earth* is 2″,06; and in that of *Venus*, 2″,95 : * that the period is 240 years : that the two inequalities were at their maximum (+ for the *Earth*, and — for *Venus*) in the year 1682; and also, but with a contrary sign, in 1802. In order to point out the importance of these corrections in the tables of *Venus* and of the *Sun*, Professor Airy has estimated roughly the places of the *Earth* and *Venus*, at the next transit of *Venus* over the sun's disc in 1874: and he states that "if the mean motions of the *Earth* and *Venus* were determined by comparing the observations, about Bradley's time, with the observations made a few years ago, the *Earth's* longitude in 1874 (when the inequalities are nearly vanishing) would be too small by nearly 4″; and that of *Venus*, too great by 6″: their difference of longitude would therefore be nearly 10″ in error: and this would produce, on the geocentric longitude of *Venus*, an effect of between 20″ and 30″." It is evident, therefore, that this inequality, although so minute, could not long have remained undetected in the present advanced state of practical astronomy; but would be sufficiently obvious and perplexing at that period. We are, therefore, the more indebted to Professor Airy, not only for having foreseen this anomaly, but also and more especially for the vast labour bestowed in its elucidation, and for the talent and skill displayed in conducting the investigations which have led to so satisfactory a result.

There is, however, another important remark which it is requisite to make in this place, (and I mention it with pride and satisfaction), that this is the first successful attempt made by any Englishman, since the time of Newton, to improve the planetary tables. Much, as we have already seen, has been done on the continent to bring the planetary system to perfection: but, few are the names which, in the country that claims Newton for its own, can boast of having added to this stock of information. Let us hail the present, then, as the harbinger of happier times, and trust that the zeal and perseverance shewn by the distinguished author of this memoir, may

* Since the above was written, I have been informed that M. Pontécoulant has verified the result given by Professor Airy.

stimulate others of his countrymen to extend their researches into the more refined and intricate branches of physical astronomy.

(*The Vice-President then, addressing Professor Airy, continued thus* :—)

Professor Airy, in the name of the Royal Astronomical Society, I present to you this medal, which has been awarded by the unanimous vote of their Council. You will accept it, Sir, as a small tribute of their respect and admiration for those rare talents which you have displayed, and for that great labour which you have undergone, in detecting the minute inequality in the motions of the *Earth* and *Venus*, in developing the cause of that anomaly, and in expounding the law by which the same may be made available to the practical observer.

But, were I thus to limit my address to this mere formal expression of their opinion, I should not do justice to my own feelings on this occasion, nor satisfy the expectation of those who now hear me. Your name, Sir, is inseparably connected with the scientific history of Europe, and is enrolled amongst those bright and illustrious characters that have enlightened it by their various labours. The several branches of pure and mixed mathematics, to which you have more especially devoted your attention, and the various researches that have arisen from those inquiries, have all felt the influence of your vigorous and powerful mind: and as director of that splendid observatory, the affairs of which you conduct with so much honour to yourself and so much benefit to astronomy, you have, by giving to the world the *reduced* as well as the recorded observations, set a noble example to other establishments of a similar kind, which, it is to be hoped, will soon be followed by them all. By these and other exertions in the cause of science, you have not only exalted your own name, but at the same time raised the reputation of the University, of which you are so distinguished a member, and added to the scientific character of your country. And I trust you will long enjoy the fruits and blessings of such well-earned fame.

The Meeting then proceeded to the election of the Council for the ensuing year, when the following Fellows were elected, viz.

President: Francis Baily, Esq. V.P.R.S. F.L.S. & G.S. & M.R.I.A.—*Vice-Presidents:* George Biddell Airy, Esq. M.A. *Plumian Prof. Ast. University of Cambridge;* Captain F. Beaufort, R.N. F.R.S.; Davies Gilbert, Esq. F.R.S. L.S. & G.S.; John William Lubbock, Esq. M.A. V.P. & *Treas.* R.S.—*Treasurer:* John Lee, Esq. LL.D.—*Secretaries:* George Bishop, Esq. Augustus De Morgan, Esq.—*Foreign Secretary:* Captain W. H. Smyth, R.N. F.R.S. & A.S.—*Council:* Bryan Donkin, Esq.;

Lieutenant Thomas Drummond, R.E.; Thomas Jones, Esq.; Rear-Admiral Sir Edward Owen, K.C.B.; Lieutenant Henry Raper, R.N.; Edward Riddle, Esq.; Rev. Richard Sheepshanks, M.A. F.R.S.; Robert Snow, Esq. B.A.; Lieutenant William S. Stratford, R.N. F.R.S.; Thomas Turner, Esq. M.A.

J. Moyes, Castle Street, Leicester Square.